CLAIMS

What is claimed is:

1. A method for evaluating heart failure within a patient using an implantable medical device, the method comprising:

detecting values representative of ventricular end-diastolic volume (EDV) of the patient; and

detecting heart failure, if present, within the patient based on the values representative of ventricular EDV.

2. The method of claim 1 wherein the values representative of ventricular EDV are detected during a pre-ejection interval.

3. The method of claim 1 wherein detecting values representative of ventricular EDV comprises taking a plurality of measurements for each cycle, and selecting a maximum value from the plurality of measurements.

4. The method of claim 1 wherein the values representative of ventricular EDV are detected during a ventricular pacing pulse.

5. The method of claim 1 wherein detecting heart failure is performed by comparing the values representative of the ventricular EDV of the patient against a threshold ventricular EDV value indicative of heart failure.

6. The method of claim 1 further comprising evaluating the severity in heart failure, if present, within the patient based on the values representative of ventricular EDV.

7. The method of claim 6 wherein evaluating the severity in heart failure is performed by comparing the values representative of the ventricular EDV of the patient against various threshold ventricular EDV values indicative of various degrees of heart failure.

8. The method of claim 1 further comprising detecting changes in heart failure within the patient based on changes, if any, over time in the values representative of ventricular EDV.

9. The method of claim 8 wherein detecting changes in heart failure is performed by comparing values representative of ventricular EDV detected over an extended period of time.

10. The method of claim 9 wherein the extended period of time is at least one month.

11. The method of claim 1 wherein detecting values representative of ventricular EDV comprises:

tracking at least one respiration cycle;

detecting values representative of ventricular EDV at like baseline points within a plurality of cardiac cycles during the respiration cycle; and

processing the values representative of ventricular EDV over at least one respiration cycle to generate an average ventricular EDV value.

12. The method of claim 11 wherein processing comprises averaging the values.

13. The method of claim 11 wherein processing comprises averaging the values over many cardiac cycles to reduce respiratory variation of the EDV value.

14. The method of claim 1 wherein the implantable medical device is coupled to at least two electrodes for implant within the ventricles and wherein detecting values representative of ventricular EDV comprises:

identifying a baseline point within a cardiac cycle for detecting the value representative of ventricular EDV;

detecting a signal representative of the impedance between the two ventricular electrodes at the baseline point in time; and

determining a baseline ventricular EDV value based on the impedance signal detected at the baseline point in time.

15. The method of claim 14 wherein detecting a signal representative of the impedance is performed by delivering a detection pulse to the ventricles using the ventricular electrodes at the baseline point and sensing ventricular impedance based on the detection pulse using the ventricular electrodes.

16. The method of claim 15 wherein the detection pulse has an amplitude selected to be sufficiently low to avoid triggering myocardial depolarization.

17. The method of claim 14 wherein identifying the baseline point within a cardiac cycle is performed by tracking a pre-ejection interval and then selecting a point within the pre-ejection interval.

18. The method of claim 17 wherein tracking the pre-ejection interval is performed by:

identifying a ventricular depolarization event; and

identifying a window 10 - 50 milliseconds (msecs) following the ventricular depolarization event.

19. The method of claim 1 wherein the implantable medical device is coupled to at least two electrodes for implant within the ventricles and wherein detecting values representative of passive filling volume comprises:

identifying a baseline point within a cardiac cycle for detecting the value representative of passive filling volume;

detecting a signal representative of the impedance between the two ventricular electrodes at the baseline point in time; and

determining a baseline passive filling volume value based on the impedance signal detected at the baseline point in time.

20. The method of claim 19 wherein identifying the baseline point within the cardiac cycle is performed by:

tracking atrial depolarization to ventricular depolarization intervals during cardiac cycles;

predicting a next expected atrial depolarization based upon the atrial depolarization to ventricular depolarization intervals; and

identifying a window 10 - 50 milliseconds (msecs) prior to a next expected atrial depolarization.

21. The method of claim 19 wherein identifying the baseline point within a cardiac cycle is performed by identifying the time for delivery of a ventricular pacing pulse.

22. The method of claim 21 wherein detecting a signal representative of the impedance is performed by:

delivering the ventricular pacing pulse using the ventricular electrodes; and

sensing ventricular impedance based upon the ventricular pacing pulse using the ventricular electrodes.

23. The method of claim 1 further comprising delivering therapy in response to heart failure.

24. The method of claim 23 further comprising adjusting the therapy in response to changes, if any, in a severity of the heart failure.

25. The method of claim 23 wherein delivering therapy comprises:

delivering cardiac resynchronization therapy (CRT) to the heart of the patient.

26. The method of claim 23 wherein an implantable drug pump is provided and wherein delivering therapy comprises delivering drug therapy to the patient using the drug pump.

27. The method of claim 1 further comprising storing diagnostic information indicative of heart failure.

28. A system for evaluating heart failure within a patient using an implantable medical device, comprising:

a ventricular end-diastolic volume (EDV) detection unit; and

a ventricular EDV-based heart failure evaluation unit operative to detect the progression of heart failure within the patient based on changes in ventricular EDV.

29. The system of claim 28 and further comprising:

a heart failure therapy controller that is responsive to detection of a progression of heart failure by the heart failure evaluation unit to adjust one or more operating parameters.

30. The system of claim 28 and further comprising:

an implantable drug pump in communication with the heart failure evaluation unit and responsive to detection of a progression of heart failure by the heart failure evaluation unit to administer a drug.

31. The system of claim 28 and further comprising:

an implantable heart failure warning device in communication with the heart failure evaluation unit and responsive to detection of a progression of heart failure by the heart failure evaluation unit to generate a warning.

32. A system for detecting the progression of heart failure within a patient using an implantable medical device, comprising:

means for determining ventricular end-diastolic volume (EDV) values; and

means for tracking the progression of heart failure, if any, within the patient based on the values representative of ventricular EDV.

33. The system of claim 32 and further comprising:

means for controlling delivery of therapy based on progression of heart failure.

34. The system of claim 32 and further comprising:

means for administering a drug based on progression of heart failure.

35. The system of claim 32 and further comprising:

means for generating a warning based on progression of heart failure.